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A BOOK WITHIN A BOOK

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A little more than twenty years ago there died in England a man who thirty-five years before had produced a classic. The *International Encyclopedia* calls him "the originator of a unique literary genre." He wrote a number of books and pamphlets on mathematics, logic, puzzles, games, politics, and religion; but is known through his pen name wherever there are children because of this masterpiece which has been translated into French, German, Italian, and Dutch, and in part into Arabic. No one, young or old, who pretends to be well read may be ignorant of this child's book whose "grotesque situations," as someone has said, "compose a peculiar literary tradition" more than he may be ignorant of the Bible or Shakespeare. There is in it an appeal both to the child and to the adult. It holds the mirror up to nature in a way that bespeaks a most remarkable knowledge of human nature; and yet in some ways the author was narrow in his outlook, and limited in his experiences. It goes without saying that he was a genius. His mode of life and of thought exhibited many of those eccentricities that we have come to associate with genius and to note without apology. Not only does it take a wise man to play the fool but it takes a wise man to write a juvenile story.

Book reviewers are confident of their ability to construct the author's philosophy from his writings. So much is known of the philosophy—in fact, of the whole mental and physical furniture

of the author under consideration—that the converse of predicting what sort of book he might evolve presents interesting possibilities. That one might not predict with accuracy, however, is shown by the response this same author made to Queen Victoria, who, having read his “childish tale,” wrote to ask if she might not see other of his works. He sent her several volumes on abstract mathematics.

Charles L. Dodgson came from a long line of scholars and clergy, one ancestor having been a bishop in the reign of George III. His own father took high honors in mathematics and the classics at Oxford and wrote on theological subjects. He was known for his wit and humor, and for his ability to tell anecdotes effectively. It was told of Charles’s mother that “her children said they never in their lives heard an impatient or harsh word from her lips.” Until he was eleven years old Charles lived on a farm, and, being left to himself much of the time, developed a most unusual strain of fancy and imagination, and played with such animals as snails and toads. Thereafter, living in a village, he invented games for the amusement of his brothers and sisters, did sleight-of-hand tricks, and wrote and gave puppet shows. It was about this time that he received a letter from his mother who had gone away on a visit and, treasuring the letter greatly, was afraid his little sisters would tear it. Accordingly he wrote on the back of it: “No one is to touch this note for it belongs to C. L. D.,” adding “Covered with slimy pitch so that they will wet their fingers.” A letter he wrote from school to his six-year-old brother contained the single characteristic sentence: “Roar not lest thou be abolished.” Of his schooling at Rugby he said: “I cannot say that I look back upon my life at a public school with any sensations of pleasure or that any earthly consideration would induce me to go through my three years again.” His schoolmaster said on his first report that he exhibited at times an illustration of that love of precise argument which seems to him natural. After several other good words he says of his faults: “He is moreover marvelously ingenious in replacing the ordinary inflexions of nouns and verbs as directed in our grammars by more exact analogies or convenient forms of his own devising.”

In 1850 he matriculated at Christ College and for forty-seven years was in residence there. He was ordained deacon, but did not go into the priesthood, partly because he stammered. He taught elementary geometry and lectured in other branches of mathematics in Oxford for more than twenty-five years, devoting the last few years of his life to writing. Besides having an impediment in speech he walked with an unsteady gait and was somewhat eccentric as to his clothes. He never wore an overcoat but wore, winter and summer, a pair of gray and black cotton gloves. He never married, saying in one of his letters: "When people ask me why I never married I tell them I have never met the young lady whom I could endure for a fortnight." One of his admirers has called him "the man who loved little children." On his grave lay a wreath inscribed: "To the sweetest soul that ever looked with human eyes." In answer to the question if children never bored him he once said: "They are three-fourths of my life. I cannot understand how anyone could be bored by little children." He was much fonder of girls than of boys. In a letter to a little girl he says: "I am fond of children (except boys) and have more child friends than I could possibly count on my fingers even if I were a centipede (by the way, *have* they fingers?). . . ." On one occasion when someone planned to send a boy to visit him he wrote imploring his friend not to send the boy. Mr. Dodgson was shy before adult strangers but made up to children on trains and at the beach, spending many happy hours with them. He always carried puzzles, games, and books in his pockets. He even had the habit of taking safety pins with him that he might pin up the little girls' dresses if they should care to go wading. He disliked photographers and interviewers, although he was a skilful amateur photographer himself and made pictures of Tennyson, Ruskin, the Rossettis, Millais, Charlotte Yonge, Faraday, Ellen Terry, the Prince of Wales, and other notables whom he counted among his friends. He wrote hundreds of letters to little girls he had met casually, and conducted discussions by mail with men on questions of logic and mathematics, though he admitted: "My view of life is that it is next to impossible to convince anybody of anything." He criticized in the letters of his youthful correspondents any statement

that was an exaggeration or that was incorrect as to English; he censored the dress and eating habits of his girl acquaintances, and was exacting in his demands upon the illustrators of his books. He rarely accepted dinner invitations, had no memory for dates or for the faces of acquaintances, would never talk about his books, or read what reviewers said about them or about him. He was mildly interested in music, having in his rooms nearly thirty music boxes which he played for the entertainment of children. He even contrived to make the mechanism turn backward for the odd effect upon the tune. He studied art and did some drawing, though Ruskin advised him that his talents were not sufficient to warrant his spending time upon sketching. He seemed to care little for flowers, but liked the open air, the sea, and sunsets.

This is a sketchy outline of the life of Rev. C. L. Dodgson, the Oxford don better known as Lewis Carroll, the author of *Alice in Wonderland*. Has there been woven into that famous story somewhat of the heart and brain of the mathematician, logician, politician, rector, poet, bachelor, lover of little children, photographer, and cartoonist?

Alice in Wonderland, which its author says "drained the wells of fancy dry," grew out of a story told one summer afternoon to three little girls. It is on the one hand so nonsensical that children sometimes feel ashamed to have been interested in anything "so silly." On the other hand it is so deep as to yield results in exegesis almost beyond belief. Interwoven in a dream fabric of rare verisimilitude is a psychological study of the reaction of the immature mind to academic training, particularly to instruction in logic and mathematics. The truth of this statement is proved or disproved in what here follows. Elsewhere Lewis Carroll makes statements of the serious purpose behind other of his books, but he gives no indication whether in *Alice* he implied any criticism of school methods or curricula. In the Introduction to his most valuable contribution to mathematical literature entitled *Euclid and His Modern Rivals*, which is cast in the form of a drama and abounds in humor, he says: "Subjects there are no doubt which are in their essence too serious to admit of any lightness of treatment—but I cannot recognize geometry as one of them." *Sylvia and Bruno*,

on which he put much time, was, as one biographer states, "half fairy tale, half mathematical treatise." It is full of childish prattle and nonsense verses, but embodies the author's concepts of Christianity and philanthropy. One may conjecture that this teacher of mathematics and lover of children unconsciously drew upon the comedies (and tragedies) of the schoolroom for his fun. Nowhere is the unthinking activity of the child at his arithmetic lesson, when he blindly tries nearly anything to get the answer, so capitally illustrated as in the trial scene in *Alice* where the bewildered jurors at the command of the King put down on their slates three disputed dates, March 14, 15, and 16, "and then added them up and reduced the answer to shillings and pence."

Throughout the book rules take the place of reason. Alice hoped she might find "a book of rules for shutting people up like telescopes." She remembered reading of children who had suffered because they *would* not remember the simple rules their friends had taught them, such as, that a red-hot poker will burn you if you hold it too long; and that if you cut your finger *very* deeply with a knife it usually bleeds; and she had never forgotten that if you drink much from a bottle marked "poison" it is "almost sure to disagree with you sooner or later." Even the King in his effort to exclude Alice from the courtroom resorts to the schoolroom device of a rule, thus:

The King, who had been for some time busily writing in his notebook, called out "Silence" and read from his book. "Rule Forty-Two—All persons more than a mile high to leave the court."

Alice's conversation with the Mock Turtle is largely concerned with schools—and here again the dream misses by so little the reality with its Reeling and Writhing, Ambition, Distraction, Uglification, Derision, Laughing and Grief, Mystery, Geography, and Drawling, Stretching, and Fainting in Coils. The boarding-school is suggested in the poems to be remembered, in the quadrille, in the insistence on etiquette, and in that most delightful misunderstanding of the phrase at the bottom of the bill, "French, music, and washing—extra."

On the sides of the rabbit hole down which she and the White Rabbit fell were bookcases, pictures, and maps; and when she

questions her own identity, thinking she might somehow have been changed for Ada or Mabel, she applies school tests, and, somewhat disconcerted to find she can't even say, "How doth the little—" concludes: "I must be Mabel after all, and shall have to go and live in that poky little house, and have next to no toys to play with, and oh! ever so many lessons to learn!" To address the Mouse she has recourse first to the Latin vocative, "O Mouse," and failing to obtain a response, tries the first sentence in her French lesson-book—"Ou est ma chatte?"

After that sorry plunge of the various animals and birds in the pool of salt tears shed by Alice when she was nine feet high, the Mouse, you remember, called out:

"Sit down, all of you, and listen to me! *I'll* soon make you dry enough! Ahem! are you all ready? This is the driest thing I know. Silence all around, if you please! "William the Conqueror, whose course was favored by the pope, was soon submitted to by the English, who wanted leaders, and had been of late much accustomed to usurpation and conquest. Edwin and Morcar, the earls of Mercia and Northumbria, declared for him, and even Stigand, the patriotic archbishop of Canterbury, found it advisable to go with Edgar Atheling to meet William and offer him the crown."

And so on. Every writer of a school history of this compact, encyclopedic, university type may well blush for shame at this disclosure of its effect upon little children!

An ordinary author, writing a dream story, makes all his hypotheses at the outset. Often this involves no more than the mere personification of animals. It requires no great gift of constructive imagery to put words into the mouths of birds and beasts. Compare any dream story with *Alice in Wonderland*. Here the author out of a well-stored mind intensifies the illusion at every turn. The essence of a dream is the "practical absence of regulation" due to the "almost unrestricted freedom of association in the dream consciousness." Material objects interact in a way contrary to the fundamental conceptions of space and time, cause and effect. That freedom of association, introduced in nearly the first paragraph, gives the keynote of the story. I quote:

Suddenly a white rabbit ran close to Alice. There was nothing so *very* remarkable in that; nor did Alice think it so *very* much out of the way to hear the Rabbit say to itself, "Oh, dear! Oh, dear! I shall be too late!" (When she thought it over afterwards, it occurred to her that she ought to have

wondered at this but at the time it all seemed quite natural); but when the Rabbit actually *took a watch out of its waistcoat-pocket*, and looked at it, and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat-pocket or a watch to take out of it.

How characteristic of dreams—not to wonder at the rabbit's talking, but to wonder at his waistcoat-pocket and watch! What delicious humor is involved in that episode where Alice, having grown to be nine feet high, weeps gallons of tears, making a pool four inches deep, and then, growing tiny and floundering around in her own tears, thinks she must be at the seashore! How plausible from the standpoint of a dream for the Duchess' baby to have turned completely into a pig before Alice realized that it was not a baby! But to the Cheshire cat it was to be expected. He asks, "What became of the baby?" and when Alice replies, "It turned into a pig," he says "I thought it would," following up the answer in a minute with the senseless question: "Did you say pig or fig?"

Lewis Carroll was so conscientious that he insisted that the artists who illustrated his books should not work on the drawings on Sunday. But his skill in verse-making leads him, in *Alice*, to parody a pious poem of Robert Southey's on Father William, the last two stanzas of which read as follows:

"You are old Father William," the young man cried,
 "And life must be hast'ning away;
 You are cheerful, and love to converse upon death;
 Now tell me the reason, I pray."

"I am cheerful, young man," Father William replied,
 "Let the course thy attention engage.
 In the days of my youth I remembered my God
 And He hath not forgotten my age."

It is interesting to compare the original with the dream version in which, as Alice says timidly, "some of the words have got altered." The Caterpillar says: "It is wrong from beginning to end."

Two stanzas in *Alice* read:

"You are old," said the youth, "and your jaws are too weak
 For anything tougher than suet;
 Yet you finished the goose, with the bones and the beak;
 Pray, how did you manage to do it?"

"In my youth," said his father, "I took to the law
 And argued each case with my wife;
 And the muscular strength which it gave to my jaw
 Has lasted the rest of my life."

The author of *Alice* taught geometry for many years and was said to have been well liked as an instructor. Might it not have been because he went far afield for illustration of knotty points. For example, in his book *The Game of Logic*, which proved most useful in teaching logic to children, he uses such a quaint syllogism as this:

Caterpillars are not eloquent;
 Jones is eloquent;
 Therefore: Jones is not a caterpillar.

A geometry teacher faces the problem of persuading each new class in turn of the need of proving propositions that seem self-evident to the student. Even after the need of rigid proof is shown, converses and corollaries seem somehow to come in under the skirts of their particular propositions. Students who succeed in understanding geometry accept the study as a sort of game in which axioms and previous proofs take the place of rules. *Alice in Wonderland* abounds in clever analogies of propositions and their converses.

While falling through the air down the rabbit hole, Alice wishes that Dinah, her cat, were with her. She thinks that in lieu of mice there might be bats, and says to herself in a dreamy sort of way; "Do cats eat bats? Do cats eat bats?" And sometimes: "Do bats eat cats?" For as she couldn't answer either question, it didn't matter much which way she put it. Again, at the Mad Tea Party:

"You should say what you mean."

"I do," Alice hastily replied; "at least—at least I mean what I say—that's the same thing, you know."

"Not the same thing a bit!" said the Hatter. "Why, you might just as well say that 'I see what I eat' is the same thing as 'I eat what I see.'"

"You might just as well say," added the March Hare, "that 'I like what I get' is the same thing as 'I get what I like.'"

"You might just as well say," added the Dormouse, who seemed to be talking in his sleep, "that 'I breathe when I sleep' is the same thing as 'I sleep when I breathe!'"

"It is the same thing with you," said the Hatter, and here the conversation dropped.

These are no other than propositions whose converses are in certain instances true and in other instances not true. I doubt not many an English boy owes his appreciation of the purpose of geometry to some such absurd analogies on the part of this master-teacher.

Negative quantities, particularly in algebra, always give the student trouble. Historically it is worth noting that while the Hindus in very early times in expressing assets and liabilities gave a negative implication to liabilities, saying, for example, that assets of two dollars with liabilities of three dollars are equivalent to liabilities of one dollar, the use of negative quantities in problems involving addition, subtraction, multiplication, and division was a later development. The early Greeks called all such negative quantities imaginary. The use of the negative sign to indicate counter-clockwise motion as opposed to clockwise, or such a difference in direction as below zero on the thermometer, or an opposite electric charge, is equivalent to adding an attribute to a real quantity. Negative quantities contribute to the humor in *Alice*. Most notable is the conversation with the Gryphon and the Mock Turtle. I quote:

"And how many hours a day did you do lessons?" asked Alice.

"Ten hours the first day," said the Mock Turtle; "nine the next, and so on."

"What a curious plan!" exclaimed Alice.

"That's the reason they're called lessons," the Gryphon remarked, "because they lessen from day to day."

This was quite a new idea to Alice, and she thought it over a little before she made her next remark. "Then the eleventh day must have been a holiday?"

"Of course it was," said the Mock Turtle.

"And how did you manage on the twelfth?" Alice went on eagerly.

"That's enough about lessons," the Gryphon interrupted in a decided tone.

Lucky the teacher who can change the subject when something irrational appears. Why does the process of subtraction lead to a perfectly consistent holiday but bring on an absurdity at the next step?

Again, when the Queen orders the Cheshire cat beheaded, there appears only the cat's head. To quote again:

The executioner's argument was, that you couldn't cut off a head unless there was a body to cut it off from, that he had never had to do such a thing before, and he wasn't going to begin at *his* time of life.

The King's argument was, that anything that had a head could be beheaded, and that you weren't to talk nonsense.

The Queen's argument was, that if something wasn't done about it in less than no time she'd have everybody executed, all round.

That is, the executioner couldn't admit the possibility of taking something from nothing; the King held that if there was something, it could be taken away; and the Queen—well, let us change the subject before our analysis of the situation leads to the implication as coming from this bachelor author and teacher, that women haven't any mathematical sense.

Again, at the Mad Tea Party:

"Take some more tea," the March Hare said to Alice very earnestly.

"I've had nothing yet," Alice replied in an offended tone, "so I can't take more."

"You mean, you can't take *less*," said the Hatter. "It's very easy to take *more* than nothing."

A child's beginning in mathematics consists in counting—that is, adding. Even subtraction is thought of as a form of adding, just as the shopkeeper adds the value of your purchase to the change he gives you to equal the coin you give him. It is a fact that children are apt to have great difficulty with the process of subtraction.

Multiplication is accepted by the child as a means of "getting somewhere" with numbers. Alice, in questioning whether she might be stupid, tries the multiplication table thus:

Let me see: four times five is twelve, and four times six is thirteen, and four times seven is—oh, dear! I shall never get to twenty at that rate!

But counting is child's play. The real universe is not set off in unit pieces. Nature in all its aspects is changing continually. As a method the Calculus in mathematics has enabled science to make its rapid progress, by determining the laws of change. Zero is not always thought of as absolute non-entity—it is the infinitesi-

mally small. The Cheshire cat, at one time only a head, at another only a grin, is a variable having for one limit the complete cat, and for the other the infinitesimal remnant, invisible to the eye but able to "come back."

Alice meets the dilemma of the absolute zero versus the infinitesimal zero when after drinking from a bottle she finds herself shutting up like a telescope (that is being a variable approaching zero as a limit). To quote:

She felt a little nervous about this; "For it might end, you know," said Alice to herself, "in my going out altogether like a candle. I wonder what I should be like then?" And she tried to fancy what the flame of a candle looks like after the candle is blown out, for she could not remember ever having seen such a thing.

In other words, she fears zero as negation or extinction, but as a variable approaching zero she may return to her proper size if she drinks the right liquid.

Many other instances, more or less obvious, of mathematical or logical concepts are scattered throughout the book. One of the cleverest of these turns the old English maxim, "Take care of the pence and the pounds will take care of themselves," into the equally true "Take care of the sense and the sounds will take care of themselves." Every teacher has wanted to tell her pupils to think what they are saying and not try to repeat the words of the book, but few have stated it so succinctly.

Perhaps Lewis Carroll never meant that we should get anything more out of *Alice* than most of us do get. The world owes him a debt for what he calls this "childish story." May it not owe him a debt for its hidden meanings—for a philosophy which would protect little children from school work that is too hard for them and from books they are too young to understand? One wonders what sort of dream story he could have written had he been, say, a chemist or a physicist or a linguist instead of a mathematician. Or does the charm of *Alice in Wonderland* come from the insight of the true teacher?